ONCOLOGY REHABILITATION: THE MISSING LINK

Restoring Health and Wellness to Patients With Cancer

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“Our horizon is never at our elbows, nor should it be. How much better to dream big, keep our sights high, and when we reach the top of the hill, spread our wings and soar higher still.”

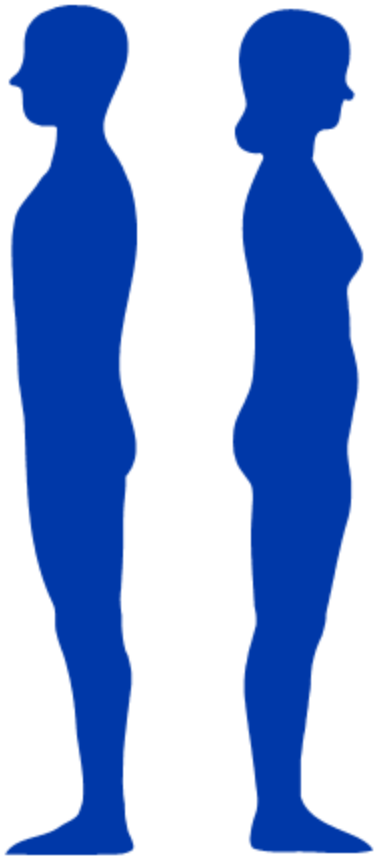
~Henry David Thoreau

Oncology Rehabilitation Objectives

- Describe how physical therapy can and should play a role in the comprehensive treatment of cancer patients.
- Identify signs and symptoms of lymphedema.
- Summarize the basic components of treatment for lymphedema.
- Discuss Cancer Related Fatigue as the most common side effect of cancer and cancer treatment. Describe contributing factors and treatment.
- Discuss a prospective surveillance model for rehabilitation in cancer patients.

Estimated New Cancer Cases* in the US in 2015

Men 848,200	
Prostate	26%
Lung & bronchus	14%
Colon & rectum	8%
Urinary bladder	7%
Melanoma of skin	5%
Non-Hodgkin lymphoma	5%
Kidney & renal pelvis	5%
Oral cavity & pharynx	4%
Leukemia	4%
Liver & intrahepatic bile duct	3%
All other sites	21%



Women 810,170	
29%	Breast
13%	Lung & bronchus
8%	Colon & rectum
7%	Uterine corpus
6%	Thyroid
4%	Non-Hodgkin lymphoma
4%	Melanoma of skin
3%	Pancreas
3%	Leukemia
3%	Kidney & renal pelvis
21%	All other sites

*Excludes basal cell and squamous cell skin cancers and in situ carcinoma except urinary bladder.

The Lifetime Probability of Developing Cancer for Women, 2009-2011*

Site	Risk
All sites†	1 in 3
Breast	1 in 8
Lung & bronchus	1 in 16
Colon & rectum	1 in 22
Uterine corpus	1 in 37
Non-Hodgkin lymphoma	1 in 52
Melanoma of the skin‡	1 in 53
Thyroid	1 in 60
Pancreas	1 in 67
Ovary	1 in 75
Leukemia	1 in 84

* For those free of cancer.
† All sites exclude basal cell and squamous cell skin cancers and in situ cancers except urinary bladder.
‡ Statistic for white women.

Source: DevCan: Probability of Developing or Dying of Cancer Software, Version 6.7.1 Statistical Research and Applications Branch, National Cancer Institute, 2014.

The Lifetime Probability of Developing Cancer for Men, 2009-2011*

Site	Risk
All sites†	1 in 2
Prostate	1 in 7
Lung & bronchus	1 in 13
Colon & rectum	1 in 21
Urinary bladder‡	1 in 26
Melanoma of the skin§	1 in 34
Non-Hodgkin lymphoma	1 in 42
Kidney & renal pelvis	1 in 49
Leukemia	1 in 59
Oral cavity & pharynx	1 in 65
Pancreas	1 in 66

* For those free of cancer.
† All sites exclude basal cell and squamous cell skin cancers and in situ cancers except urinary bladder.
‡ Includes invasive and in situ cancer cases
§ Statistic for white men.

Source: DevCan: Probability of Developing or Dying of Cancer Software, Version 6.7.1 Statistical Research and Applications Branch, National Cancer Institute, 2014.

Trends in Five-year Relative Cancer Survival Rates (%), 1975-2010

Site	1975-1977	1987-1989	2004-2010
All sites	49	55	68
Breast (female)	75	84	91
Colon	51	60	65
Leukemia	34	43	60
Lung & bronchus	12	13	18
Melanoma of the skin	82	88	93
Non-Hodgkin lymphoma	47	51	71
Ovary	36	38	45
Pancreas	3	4	7
Prostate	68	83	100*
Rectum	48	58	68
Urinary bladder	72	79	79

5-year relative survival rates based on patients diagnosed in the SEER 9 areas from 1975-1977, 1987-1989, and 2004-2010, all followed through 2011.
*99.6%
Source: Surveillance, Epidemiology, and End Results (SEER) Program, National Cancer Institute, 2014.

Cancer as a Chronic Disease

- Five-year survival rate for all cancers is 68%
  - Breast Cancer: 89%
- An estimated 232,670 cases of breast cancer expected to be diagnosed in 2015 in women
  - **2,360** in men
- Worldwide, cancer morbidity creates the largest economic burden on society
  - This does not include the cost of treating the cancer
- Twenty percent greater than heart disease

ACS Surveillance Research, 2015

Cancer as a Chronic Disease

- Cancer is a leading cause of morbidity
  - Chemotherapeutic toxicities
  - Late effects of radiation therapy
  - Adverse sequela of surgical interventions
- Morbidity costs
  - Management of sequela
  - Lost productivity due to illness

ACS Facts and Figures, 2015

Survivorship

- There are more than 13 million cancer survivors in the United States today.
- As this number continues to grow, so too does the need to develop viable rehabilitation programs to help restore function.

Survivorship

- Survivorship should be a distinct phase of cancer care.
- Oncology rehab is a key component of an excellent survivorship program.

Oncology Rehab

Facilitates optimal physical and emotional recovery from cancer and its treatments

Oncology Rehabilitation Is A Critical, and Often Missing Piece of the Cancer Care Continuum!

Oncology Rehab

Millions of Cancer Survivors Are Suffering From Debilitating Side-Effects Caused By Cancer and Cancer Treatments.

Physical Therapy Can Help!

Side Effects of Cancer and Cancer Treatments

- Pain
- Fatigue
- Loss of Range of Motion of Joints
- Muscle Atrophy
- Loss of Strength
- Lymphedema

Side Effects of Cancer and Cancer Treatments

- Postural Instability
- Balance Deficits
- Scar Tissue/Adhesions
- Depression
- Anxiety
- Peripheral Neuropathy

A Patient's Perspective

A

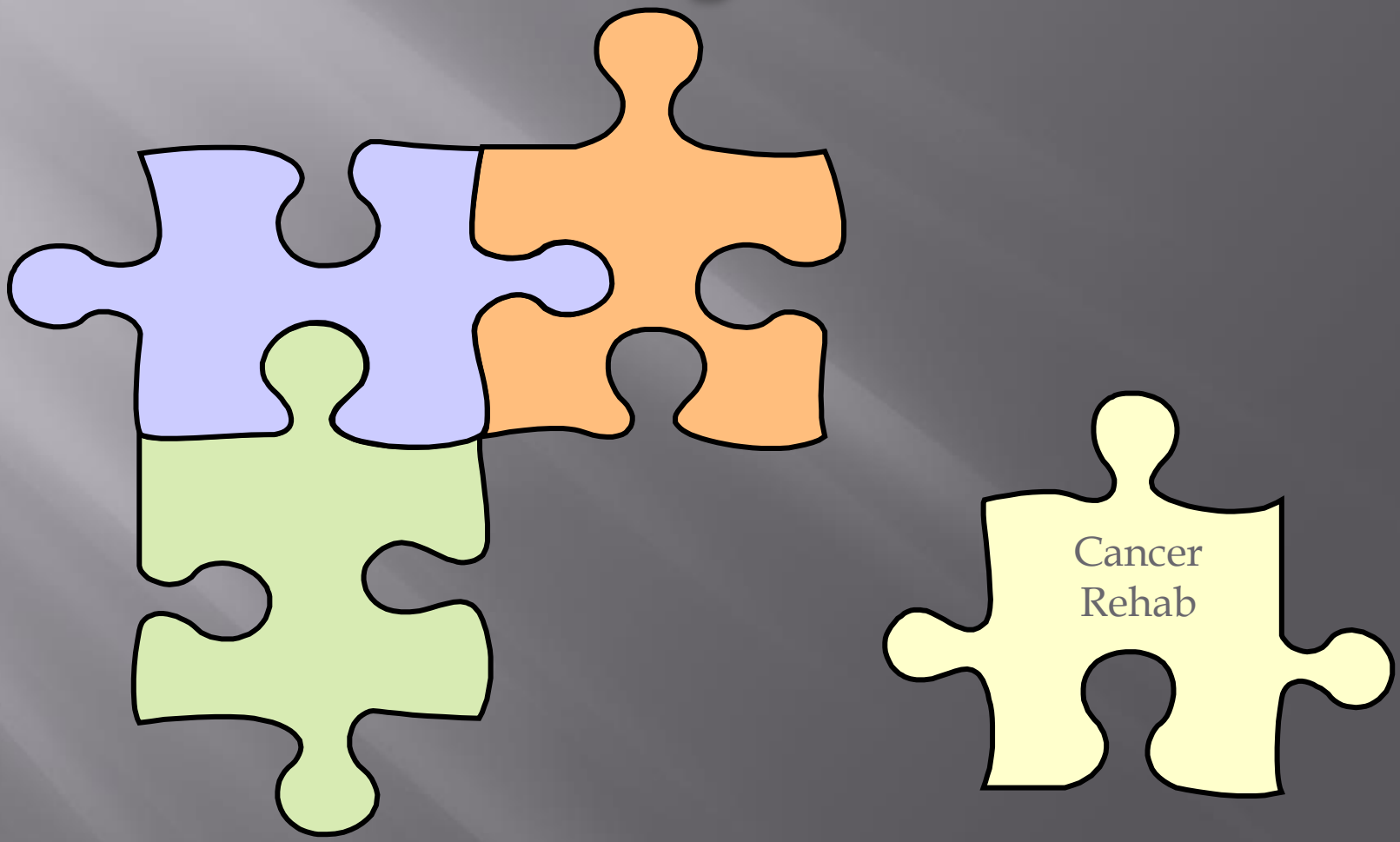
“New Normal”

?!!!!!!!

HOW CAN I HEAL?

Patients need well-coordinated oncology rehabilitation to heal as well as possible.

Excellent Survivorship Program



Institute of Medicine Report

From Cancer Patient to Cancer Survivor: Lost in Transition

Cancer-Related Functional Problems

- 244 patients undergoing cancer treatment at Mayo Clinic
- Given a 27-item questionnaire addressing cancer related symptoms, signs and functional problems
- 202 (83%) reported at least one item was a problem
- 65.8% reported a functional problem
- Difficulty with balance/ambulation most frequently cited problems
- EMR reviewed: functional problems reported in 6% of patients; 2 referrals to rehab

Cheville, A.L. et al. (2009)

Screening for Disablement and Physical Impairments

- Item Response Theory (IRT)-based assessment may be a promising means to detect early disablement.
- Activity Measure for Post-Acute Care (AM-PAC): activity limitations instrument developed using WHO's ICF (outcomes measure)
- ICF's definition of *activity limitation* is "difficulty in the execution of a task or action by an individual"
- Cheville is using 5 items from the AM-PAC to screen for disablement and physical impairments in several survivorship clinics

Cheville, A.L. et al. (2012), Jette, A.M. (2007)

Side Effects of Cancer and Cancer Treatments

Pain

Side Effects of Cancer and Cancer Treatments

Range of Motion Deficits

Side Effects of Cancer and Cancer Treatments

Muscle Atrophy

Loss of Strength

Side Effects of Cancer and Cancer Treatments

Postural Instability

Core Weakness

Side Effects of Cancer and Cancer Treatments

Balance Deficits

Side Effects of Cancer and Cancer Treatments

Scar Tissue/Adhesions

Side Effects of Cancer and Cancer Treatments

Axillary Web Syndrome

(Cording)

Axillary Web Syndrome

- Characterized by distinctive palpable cordlike subcutaneous tissue extending from the axilla into the medial arm (appears after axillary dissection)
- Often visible, and made more prominent with shoulder abduction
- Often associated with limited shoulder range of motion
- Cords often extend into elbow (antecubital fossa), and may extend as far distal as the wrist and hand

Stubblefield et al (2014), Torres Lacomba et al (2009)

Axillary Web Syndrome

- Pathogenesis is still unclear, but it is attributed to lymphovenous injury during axillary surgery due to tissue retraction and/or patient positioning
- No involvement of intercostobrachial nerve
- Tissue sampling of the cords showed fibrin clots in lymphatic channels
- More common with ALND, but also occurs with SLND

Molkovitz et al (2001)

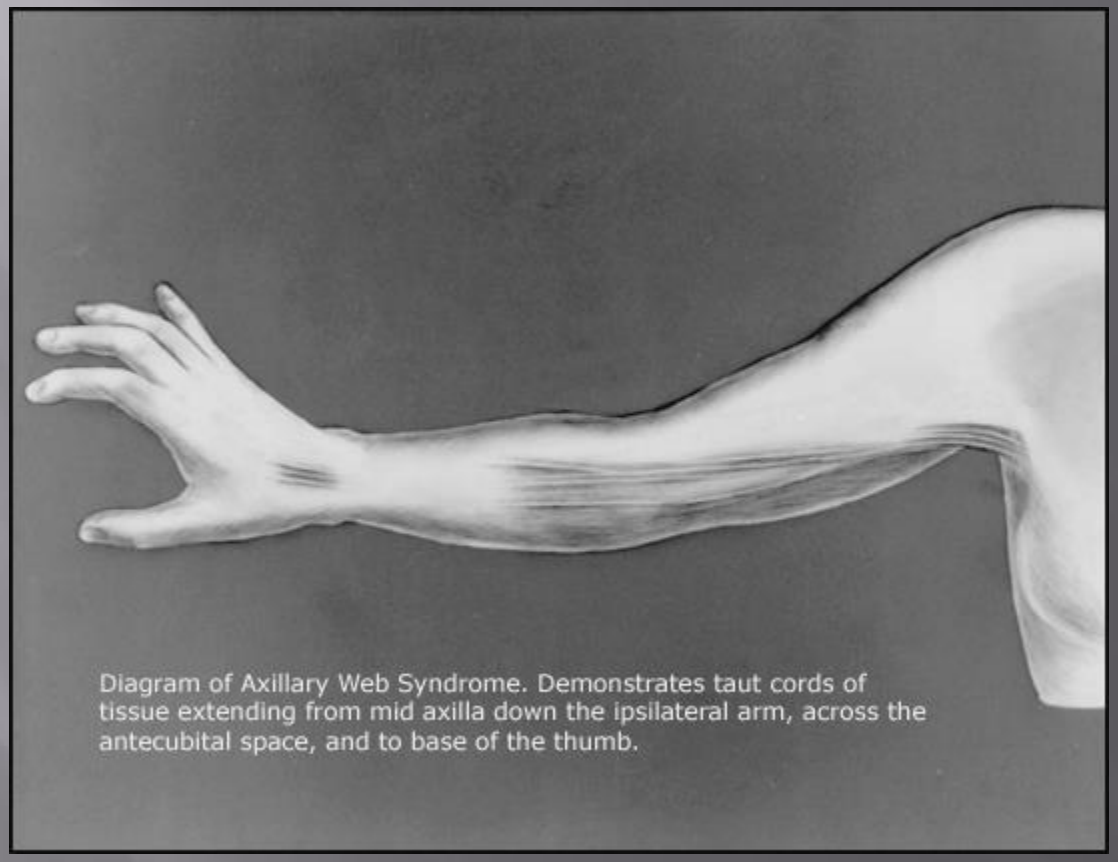


Diagram of Axillary Web Syndrome. Demonstrates taut cords of tissue extending from mid axilla down the ipsilateral arm, across the antecubital space, and to base of the thumb.

Physical Therapy Treatment for Axillary Web Syndrome

- Manual Therapy: Myofascial Release, soft tissue mobilization
- Complete Decongestive Physiotherapy/ Manual Lymph Drainage
- Range of Motion exercises

Side Effects of Cancer and Cancer Treatments

Depression

Anxiety

Side Effects of Cancer and Cancer Treatments

Cancer Related Fatigue

Cancer Related Fatigue

- Most common side effect of cancer and cancer treatment
- 90% of cancer patients receiving treatment have fatigue
- 30-75% feel continued fatigue for months or years after treatment is over
- Many factors contribute to this fatigue

Cancer Related Fatigue

- Causes
  - *Cancer and cancer treatment
  - *Pain
  - *Not getting enough exercise
  - *Anemia
  - *Distress
  - *Sleep problems
  - *Poor nutrition
  - *Medication
  - *Health Problems/Co-morbidities

EXERCISE

There is significant scientific evidence that exercise can substantially reduce Cancer-related Fatigue and improve Quality of Life.

Exercise Research

- Improve quality of life
- Reduce cancer-related fatigue
- Improve cardiovascular fitness, muscle strength, self-esteem
- Reduce anxiety, depression
- Mitigate acute, chronic, and late side effects of cancer and its treatments

Exercise Research

There is evidence to support that exercise, consistent with the guidelines for general health promotion, is associated with a **lower risk of recurrence** and **longer survival** in cancer patients.

The Good News

- Healthy lifestyle behaviors that encompass regular exercise, weight control, healthy nutrition, and support groups can greatly reduce cancer-treatment associated morbidity and mortality in cancer survivors and can enhance quality of life.
- There is strong evidence for the role of exercise in cancer management across the cancer experience, from diagnosis to survival.

Physical Therapy

- Restorative Rehabilitation
- Supportive Rehabilitation
- Preventive Rehabilitation
- Palliative Rehabilitation

Prospective Surveillance Model

Why prospective surveillance?

- Surveillance enables early detection of and intervention for treatment-related impairments.
- Early intervention will decrease severity or prevent impairment and functional loss at all stages of disease management.
- This provides more effective management and prevention of progression of morbidity.

(Stout et al 2008, Gerber et al 2010, Springer et al 2010, Stout et al 2011, Torres Lacomba 2010)

Why prospective surveillance?

- Economic burden of cancer morbidity
  - Worldwide cancer morbidity creates the largest economic burden on society.
    - This does not include the cost of treating cancer.
  - 20% greater than heart disease
  - Greater than morbidity with HIV/AIDS and TB

Why prospective surveillance?

- A vision for physical therapy . . .

  "The only thing worse than being blind is having sight but having no vision." ~Helen Keller

- Physical therapists are movement specialists, experts in movement dysfunction.
- Physical Therapists are skilled in identification of impairments.
- Physical Therapists are equipped with the knowledge and skills to treat physical impairments.

Screening

When do I refer to Physical Therapy?

Case Study

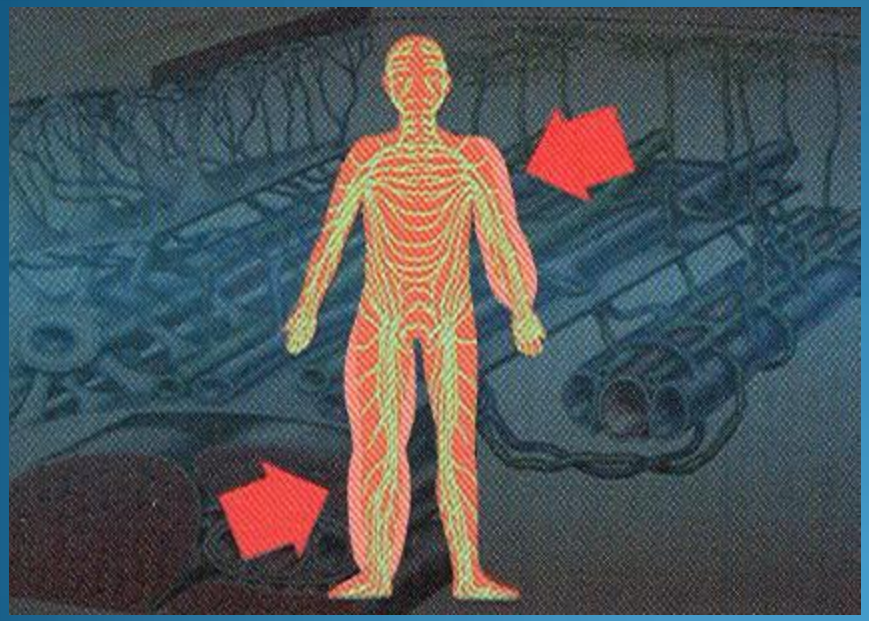
Patient 1

Case Study

Patient 2

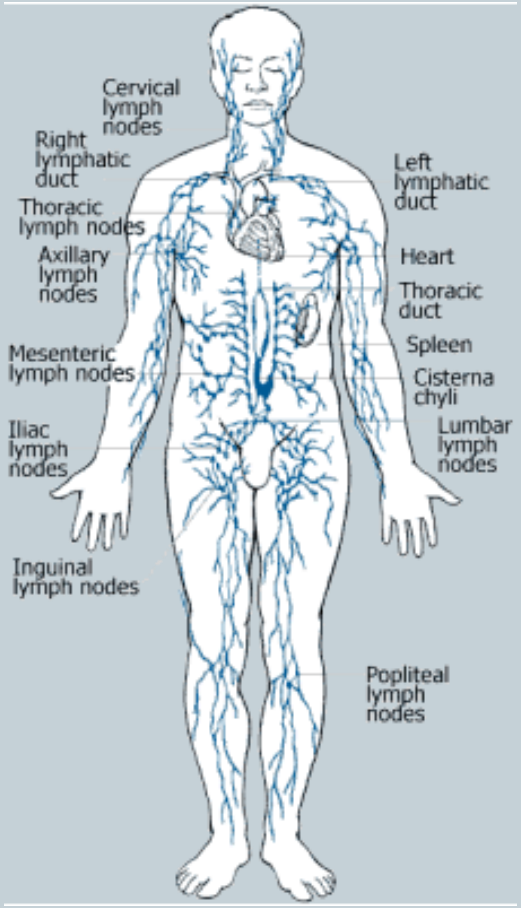
LYMPHEDEMA

What is Lymphedema?



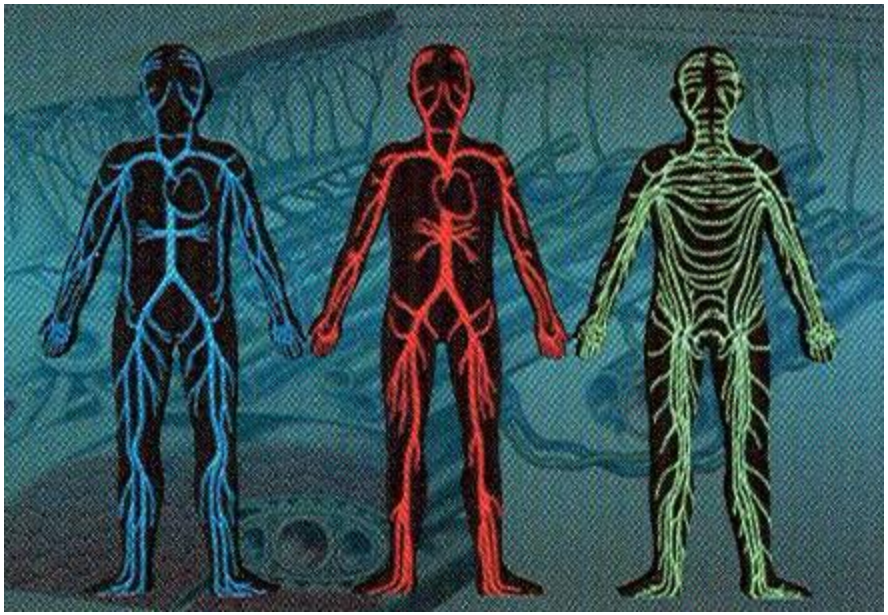
- ***Lymphedema*** is an accumulation of protein-rich fluid in the tissues which results is swelling of a body part, usually the arm or leg.

ANATOMY


Cervical lymph nodes
Right lymphatic duct
Thoracic lymph nodes
Axillary lymph nodes
Mesenteric lymph nodes
Iliac lymph nodes
Inguinal lymph nodes
Left lymphatic duct
Heart
Thoracic duct
Spleen
Cisterna chyli
Lumbar lymph nodes
Popliteal lymph nodes

The Lymphatic System

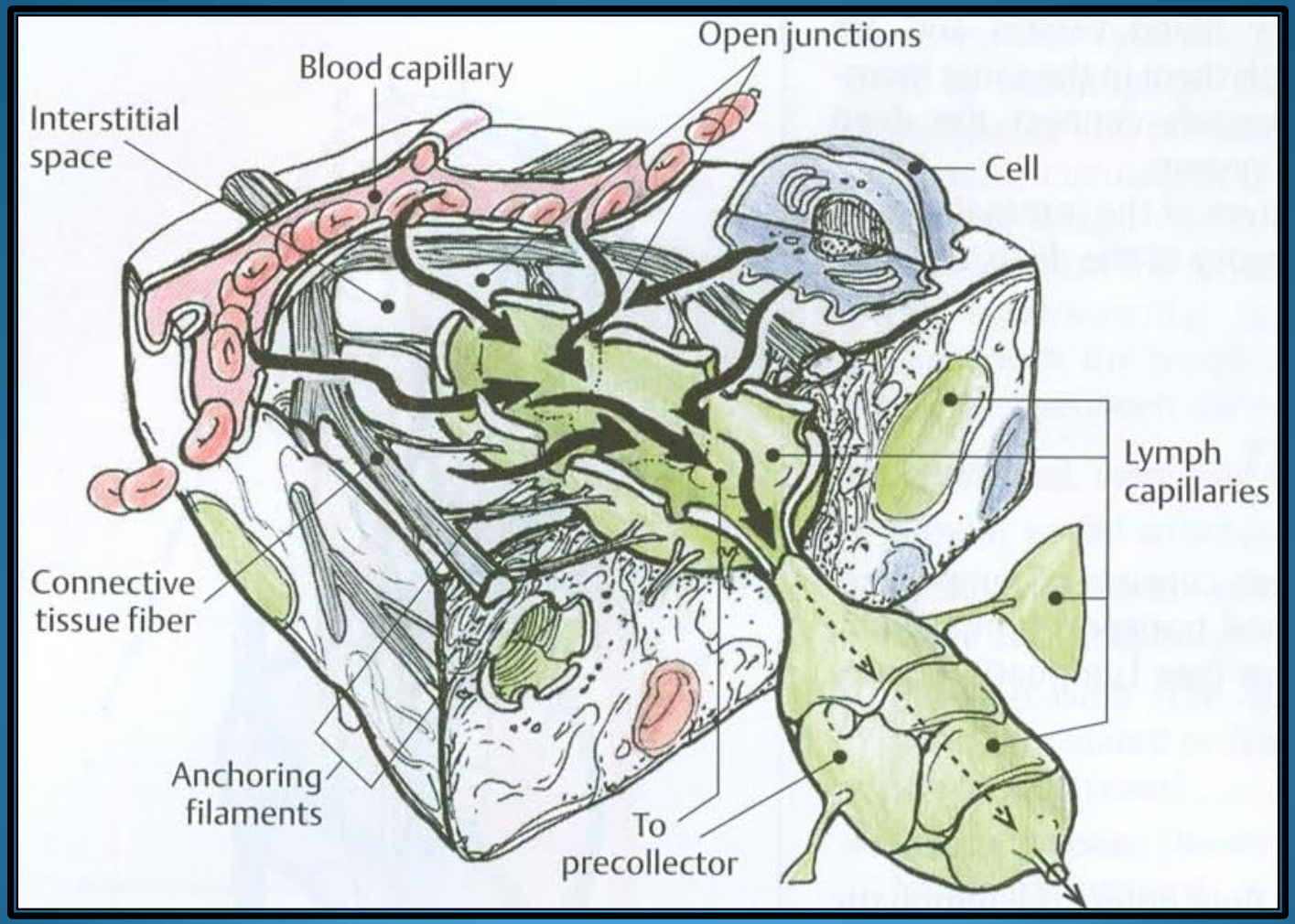
- One-way drainage system
- Consists of lymph vessels, nodes, organs (spleen, thymus, tonsils)
- Immunological functions
- Drains substances from interstitial tissues and transports them back into the blood system
- Lymphatic Load: protein, water, cells, fat



The Lymphatics

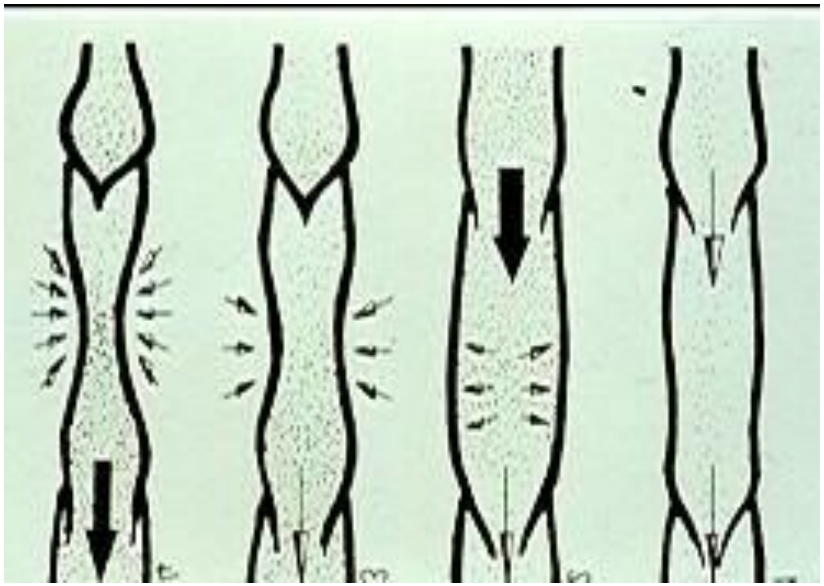
- Lymph Capillaries
- Pre-collectors
- Collectors
- Regional Lymph Nodes
- Lymphatic Ducts

Lymph Capillaries

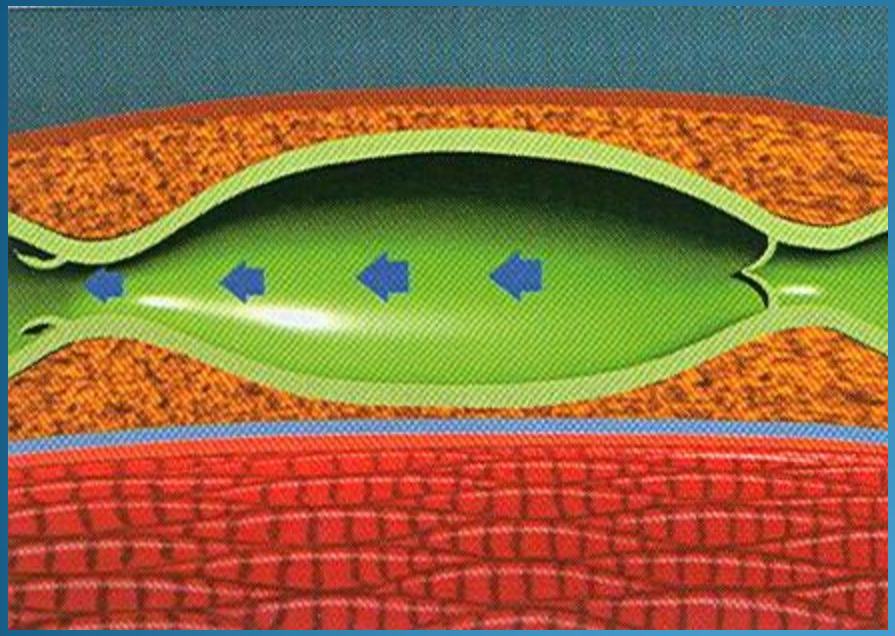


Lymph Collectors

- Anatomically similar to blood vessels
- Valves allow flow of lymph in only one direction
- Lymph angions: smooth muscle rings
- “Pearl necklace”



Lymph Collectors

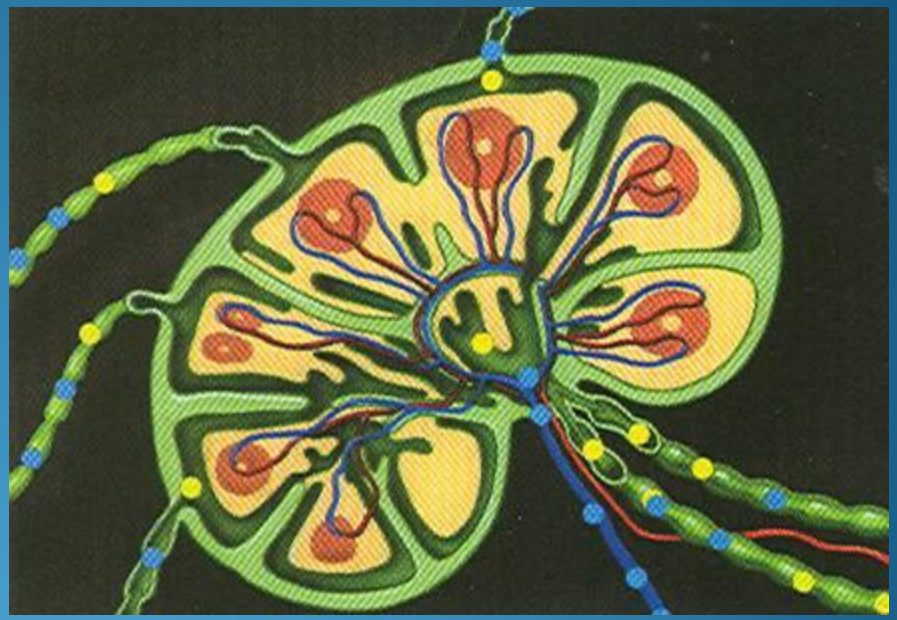


Lymph Angions:

The influx of lymph results in a stretch of the wall of the *lymph angions*. The smooth muscle surrounding the lymph angion responds to stretch by contracting, thus moving the lymph fluid proximally.

Lymph Nodes

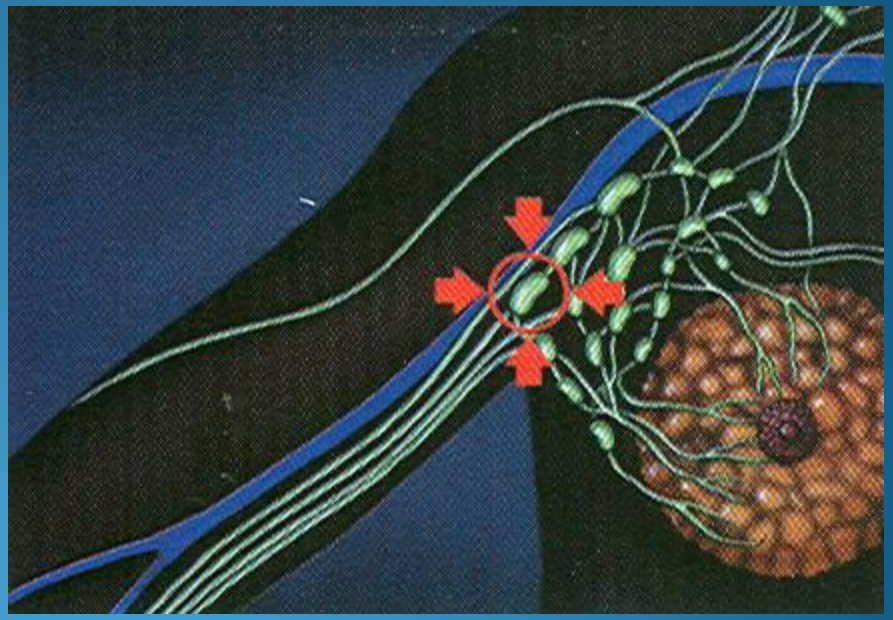
- The lymph collectors transport the lymph directly into their regional ***Lymph Nodes***
- Lymph flow is slowed here, allowing macrophages to phagocytize noxious substances (bacteria, toxins, dead cells)
- Necessary immune reactions take place here



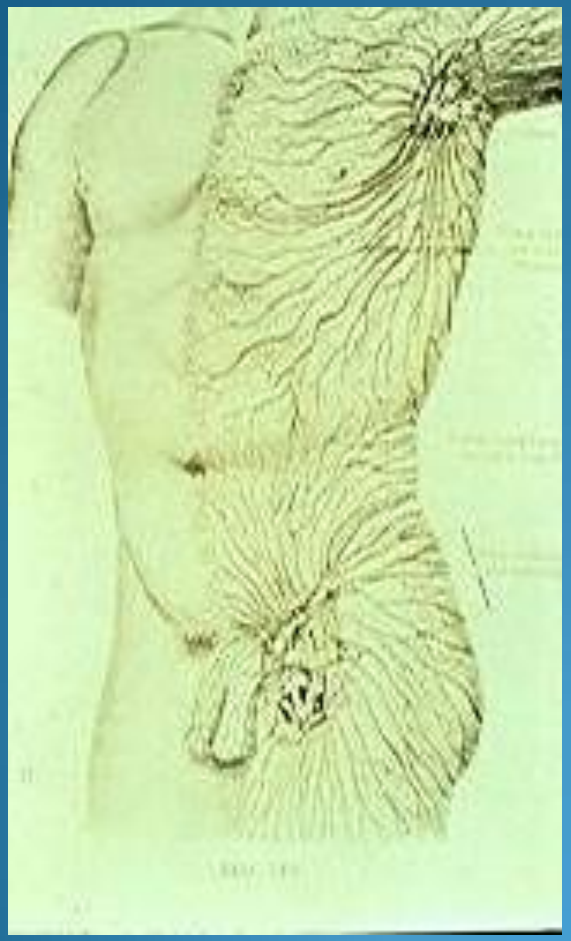
Lymph Nodes

- **Axillary Lymph Nodes**:

  The upper extremity, skin of the thorax above the horizontal watershed (waist), and most of the mammary gland drain into the axillary lymph nodes.



Lymph Nodes



- ***Inguinal Lymph Nodes:***

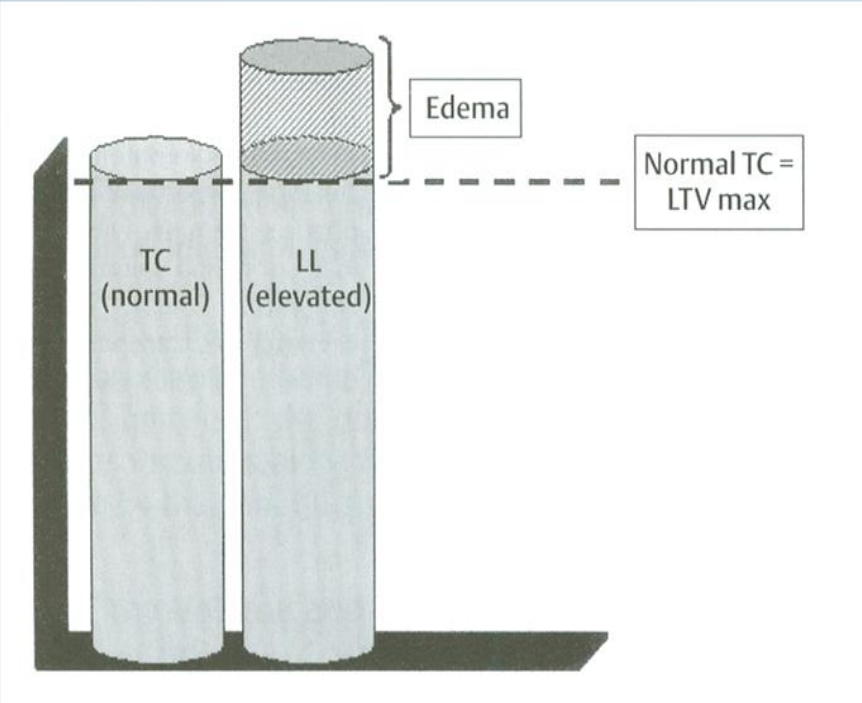
  The abdominal, lumbar, and gluteal areas, as well as the exterior genitalia and the lower extremity drain into the inguinal lymph nodes.

Return to the Blood Circulation

After passing through a large number of lymph nodes, the lymph fluid empties into the venous system at the “venous angle” (internal jugular and subclavian veins).

About 2-3 Liters of lymph flow into the blood circulation each day.

Dynamic Insufficiency



- If the lymphatic load exceeds the TC of the healthy lymphatic system, fluid will accumulate in the interstitial tissue, causing ***edema.***

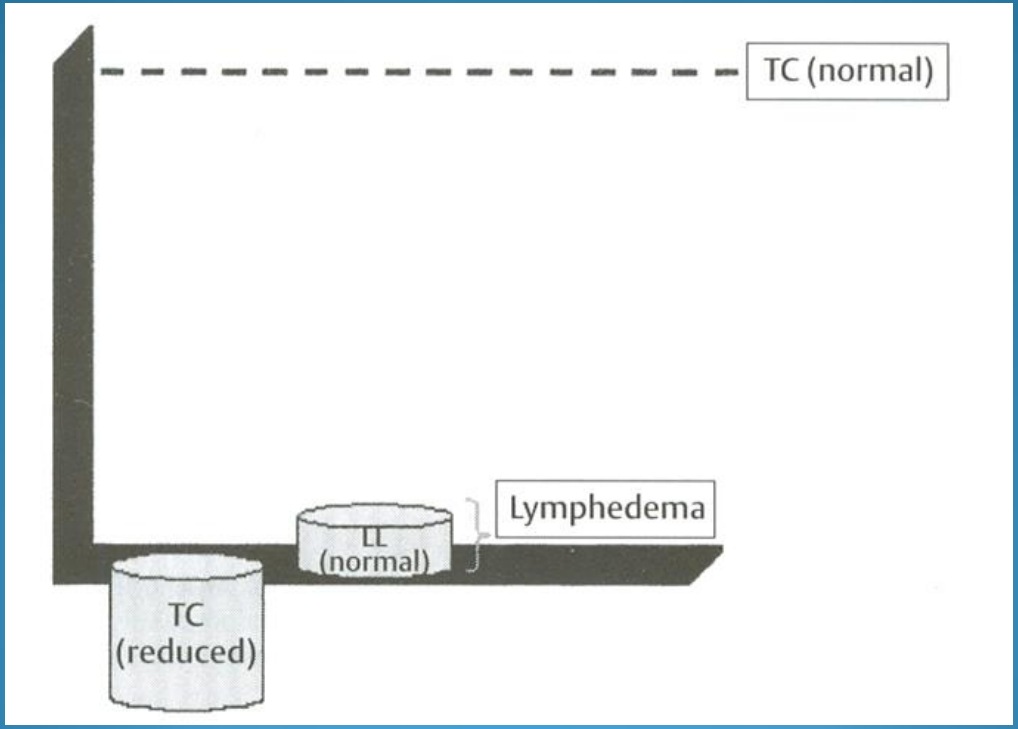
Mechanical Insufficiency

- When the lymphatic system is *compromised* due to trauma, surgery, radiation, infection, valvular or mural insufficiencies, or malformation of the lymphatic system, mechanical insufficiency can result.

- In this case, the diseased lymphatic system is not able to cope with the *normal amount of lymphatic load*.

Mechanical Insufficiency

- The lymphatic system cannot activate the LSF and thus, ***lymphedema*** results.



Combined Insufficiency

- In this case, the lymphatic load is increased and at the same time, the TC of the lymphatic system is decreased. This results in serious swellings/lymphedema.
- For example, a person with lymphedema develops an infection in the lymphedematous area (increased lymphatic load, and thus increased lymphedema).
- Meticulous skin and nail care is of utmost importance!

Primary Lymphedema

- Caused by a congenital malformation of the lymphatic system
- May be present at birth or develop some time during the course of life when the impaired lymphatic system can no longer cope with the demands placed upon it

Secondary Lymphedema

Caused by a known pathological condition:

*dissection and/or radiation of lymph nodes

*trauma

*chronic inflammations of lymph vessels/nodes

*malignancies/tumors

Stages of Lymphedema

- Latency Stage
- Stage I – “reversible”
- Stage II – “spontaneously irreversible”
- Stage III – “lymphostatic Elephantiasis”

Latency Stage

- TC of the lymphatic system is reduced but still able to cope with the normal amount of lymphatic load
- No visible swelling
- Example: A patient has had lymph nodes removed, but the lymphatic load has not increased above the TC.

Stage I

- TC drops below the normal amount of lymphatic load and swelling develops
- Tissue is soft-”pitting”
- Elevation helps to reduce swelling
- Swelling usually decreases overnight

Stage I

**No secondary tissue changes

Stage II

- Lymphostatic fibrosis (proliferation of tissues)
- Little or no pitting
- Hardening of tissues
- Frequent infections

Stage III - Elephantiasis

- Extremity becomes larger and tissue becomes harder
- Skin changes occur, such as papillomas, deep skin folds
- Fungal infections

Treatment for Lymphedema

Complete Decongestive Therapy/ Manual Lymph Drainage

Complete Decongestive Therapy

Complete Decongestive Therapy is the most effective treatment in the management of lymphedema. It is a *non-invasive* treatment designed to decrease and maintain the reduction in swelling. The treatment plan consists of 4 main components.

Complete Decongestive Physiotherapy

Manual Lymph Drainage

Compression Bandaging

Exercise

Meticulous Skin & Nail Care

Manual Lymph Drainage

- This is a gentle manual treatment technique which improves the activity of lymph vessels and re-routes the lymph flow around the blocked areas into more centrally located lymph vessels.

- MLD is based upon the “Vodder” technique (Dr. Emil Vodder), consisting of four basic strokes.

Manual Lymph Drainage

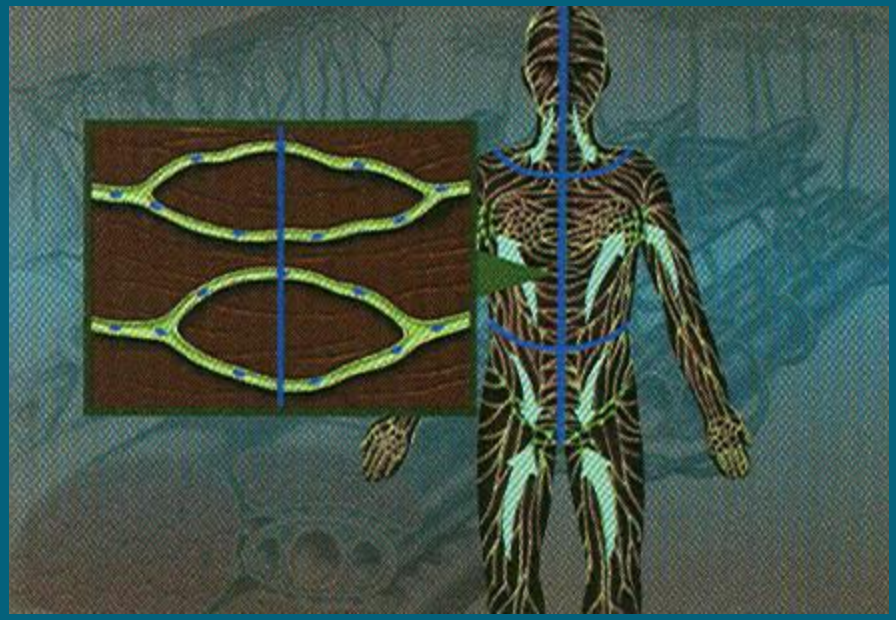
- These strokes are designed to stretch the walls of the epifascial lymph vessels, thus increasing their activity and pushing the lymph fluid in the appropriate direction.

- This utilizes anastomoses between lymph node groups.

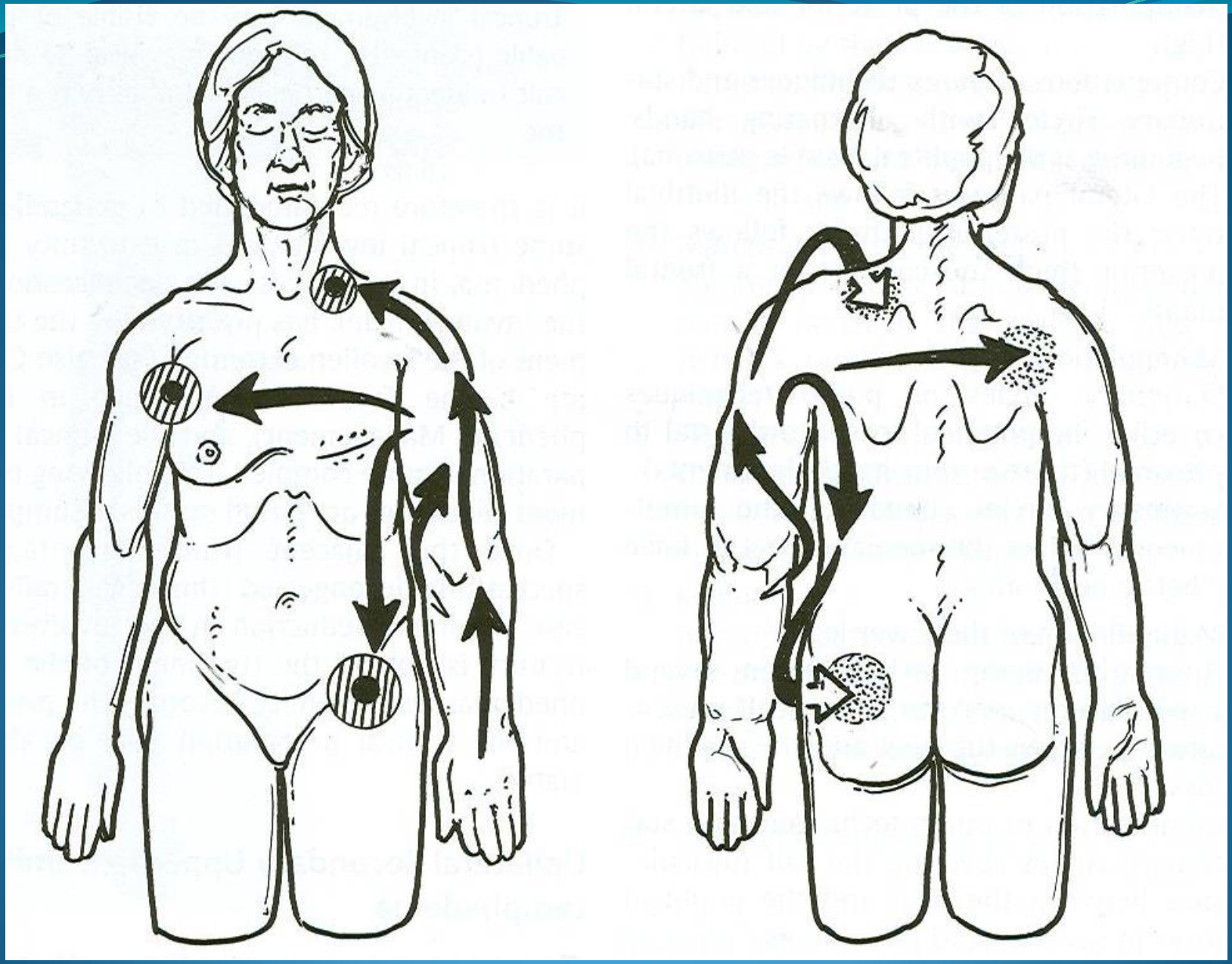
Manual Lymph Drainage

- In the normal state, lymph is drained from the individual areas separated by watersheds into the regional lymph nodes.
- Anastomoses connect the lymph territories. Usually, only small amounts of lymph flow through these anastomoses.

Manual Lymph Drainage:



- MLD begins in the healthy, non-edematous territories.
- A suction is created by the increase in lymphangiomotoricity.
- The anastomoses dilate and the lymph is transported from the edematous area into the edema-free areas.



Compression Bandaging

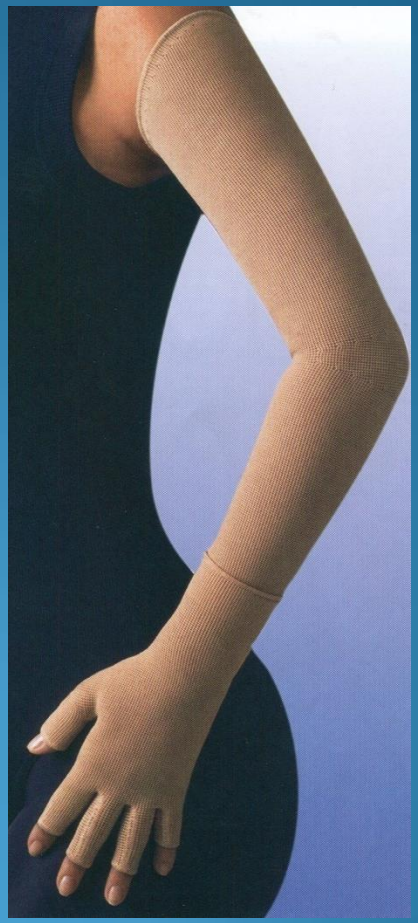
- The decongestion achieved by MLD is maintained and optimized by compression therapy.
- Compression therapy increases the tissue pressure and prevents re-accumulation of lymph fluid.

Compression Bandaging

- Special short-stretch bandages are applied to the extremity after every treatment session.
- These bandages have a high working pressure (to activate muscle pump action) and a low resting pressure.
- (This is in contrast to longstretch bandages, which have a high resting/low working pressure).

Compression Garments

- In Phase II of therapy, compression is applied via ready-to-wear or custom-made garments.
- The patient wears these daily.



Decongestive Exercises

- The patient performs simple range-of-motion exercises while wearing the compression bandages or garment.
- This aids the muscle and joint pumps to increase the effectiveness of compression therapy.
- Exercises are prescribed according to the patient's specific needs (improve and/or prevent loss of range-of-motion, improve strength and mobility).

Meticulous Skin and Nail Care

- Infections are a common and serious complication of lymphedema (cellulitis, fungal infections).
- It is imperative that each patient exercise meticulous skin and nail care to help prevent infection.
- Therapy cannot proceed until infections are under control.

Phases of Treatment

Complete Decongestive Therapy is divided into two phases.

Phase I – Intensive Phase

- MLD is performed by a certified therapist daily (3-5 days/week) for 2-4 weeks.
- Compression bandages are applied after each session and the patient is instructed in therapeutic exercise.
- Patient education is a very important component of Phase I.

Phase I – Patient Education

- Patient education is key to insure the patient maintains and even improves the condition after Phase I ends:
  - *self-MLD
  - *self-bandaging
  - *proper exercises
  - *skin and nail care
  - *care of bandages/garments
  - *prevention of infection/swelling

Phase I – Goals

- Mobilize the accumulated protein-rich fluid

  *REDUCE SWELLING

- Initiate reduction of fibrosclerotic tissue

Phase II

- Once the extremity is completely decongested, the patient continues at home with Phase II.
- Compression garments are worn during the day and bandages (or a special night time garment) are worn when the patient sleeps.

Phase II

- The patient must also continue proper skin care, home exercises, and self-MLD.
- He or she should continue with regular check-ups with the physician and with the MLD Certified Therapist.
- The patient will need new compression garments at least every 4-6 months.

Phase II - Goals

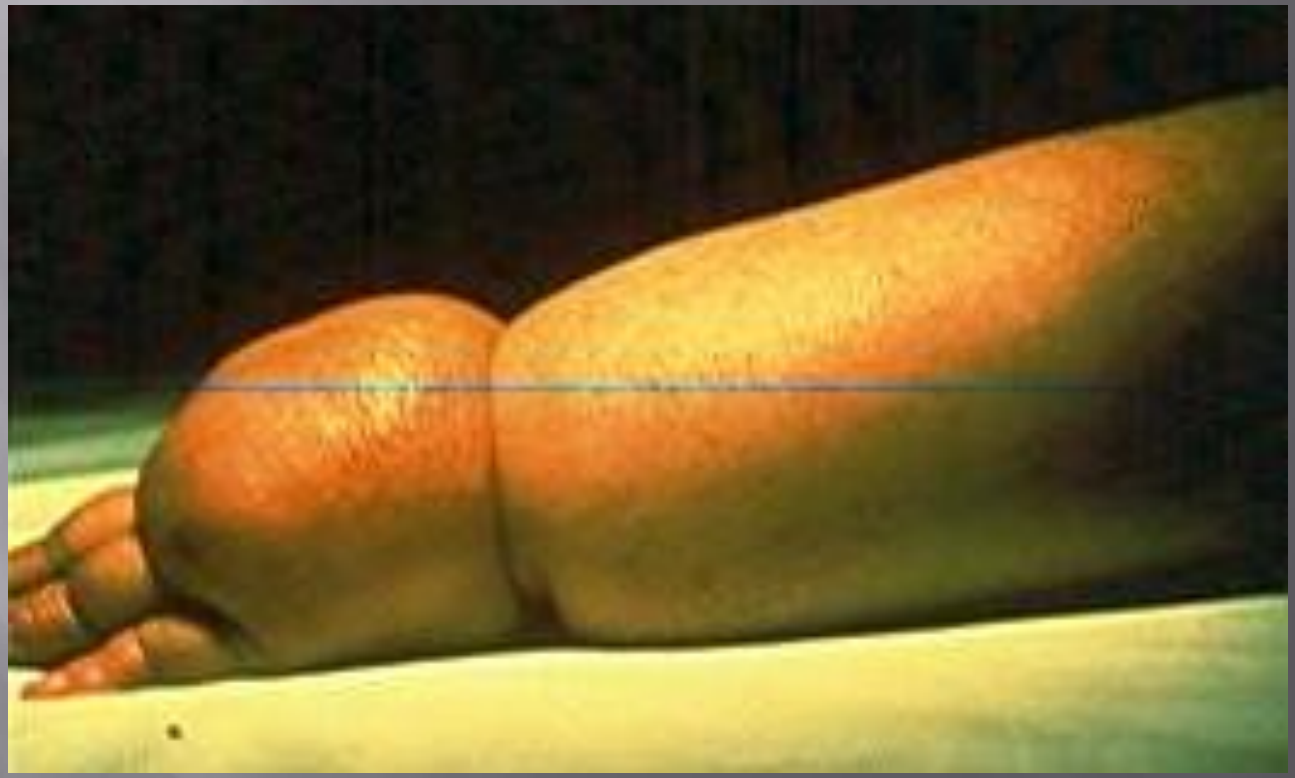
- Preserve and improve success achieved in Phase I
- Further reduce lymphostatic fibrosis/sclerosis

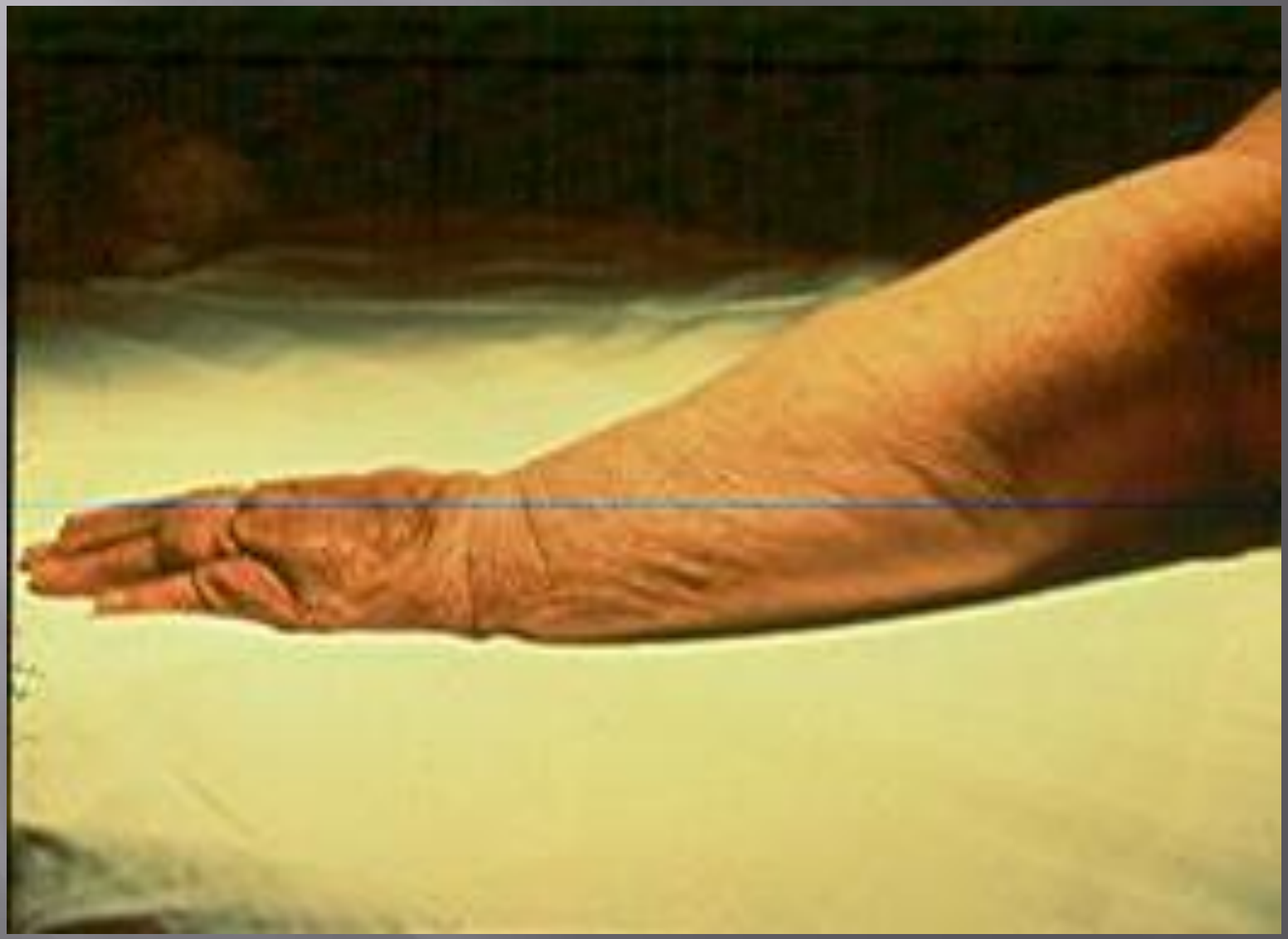
Goals of Lymphedema Treatment

- Utilize remaining lymph vessels/pathways
- Decongest swollen body part (extremity and ipsilateral trunk quadrant)
- Eliminate fibrotic tissue
- Avoid re-accumulation of lymph fluid
- Prevent/eliminate infections
- Maintain normal/near normal size of the extremity

Lymphedema

- Early detection is vital to preventing the progression of the disease.
- Early treatment will minimize tissue damage, reduce treatment time (and cost to the patient), and prevent further complications (such as infection, tissue changes, loss of range of motion, loss of function).





Other Treatments

Pneumatic Compression Pumps

Disadvantages:

- Remaining intact functioning lymph collectors may be damaged
- Trunk quadrants may fill with fluid
- External genitalia may swell
- Moves fluid from distal to proximal extremity, where it accumulates

Diuretics

- Most experts agree that the use of diuretics in the management of uncomplicated lymphedema is ineffective and may lead to the worsening of symptoms.

Diuretics

- Diuretics remove the water content of the edema, while the protein molecules remain in the tissue spaces.
- These proteins continue to draw water to the edematous area as soon as the drug loses its effectiveness.
- Diuretics result in a higher concentration of proteins in the edema fluid and may cause the tissue to become more fibrotic.

Complete Decongestive Therapy

- This treatment is safe, reliable, and non-invasive.
- CDT shows good results in both primary and secondary lymphedema.
- CDT consists of four basic components: Manual Lymph Drainage, Compression Therapy, Exercises, Skin Care.

Complete Decongestive Therapy

- CDT is beneficial in all stages of lymphedema.
- Treatment should be initiated at the first signs of lymphedema.
- If treatment begins early, the duration of treatment is usually shortened and the lymphedema is usually easier to control.

Case Study

Patient 1

Case Study

Patient 2

Conclusion

- Exercise can play an important role in the rehabilitation of cancer survivors during and after treatment.
- It is important that guidelines be followed to ensure exercise is prescribed to the right patients, at the right time, to optimize efficacy and safety.

CONCLUSION

Cancer survivors can benefit from an oncology referral to a qualified physical therapist.

Physical Therapy

- Physical therapists can perform a thorough assessment to identify movement dysfunctions, range of motion and strength deficits, and musculoskeletal impairments.

- This will ensure that exercise prescriptions for cancer survivors will be individualized and tailored to the patient's specific needs.

Resources

- Academy of Lymphatic Studies
  acols.com
- Lymphology Association of North America (LANA)
  clt-lana.org
- National Lymphedema Network (NLN)
  lymphnet.org
- National Cancer Institute (NCI)
  cancer.gov
- American Physical Therapy Association (APTA)
  apta.org

Questions

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Thank You!